

REMARKS

Claims 1-62 are pending in this Application. No new matter is added. Reconsideration in view of the following remarks is respectfully requested.

I. Claims Define Patentable Subject Matter

The Office Action rejects claims 1-8, 16-18, 20-21, 29, 34-41, 49-51, 53-54, and 61-62 under 35 U.S.C. §103(a) as being unpatentable over Affes (US 2002/0051433) in view of Unser ("Sampling -- 50 Years After Shannon", Proceedings of the IEEE, Vol. 88, No. 4; pages 569-587, April 2000); rejects claims 9-15, 19, 22-25, 30, 42-48, 52, and 55-58 under 35 U.S.C. §103(a) as being unpatentable over Affes in view of Unser and further in view of Agee (US 2003/0123384); rejects claims 26 and 59 under 35 U.S.C. §103(a) as being unpatentable over Affes in view of Unser, Agee, and further in view of Huang (USPN 6,370,129); rejects claims 27 and 60 under 35 U.S.C. §103(a) as being unpatentable over Affes in view of Unser and further in view of Shatti (USPN 7,076,168); rejects claim 28 under 35 U.S.C. §103(a) as being unpatentable over Affes in view of Unser and further in view of Langberg (USPN 5,852,630); and rejects claims 31-33 under 35 U.S.C. §103(a) as being unpatentable over Affes in view of Unser, Agee, and further in view of Baum (USPN 7,218,666). In response to arguments filed in response to the previous Office Action, the Examiner has indicated that he believes Pedersen et al, Haga et al and Pawelski provide motivation for the skilled person to modify the method resulting from the combined teaching of Affes and Unser, to arrive at the invention according to claims 1, 28, 34, and 61-62. Applicants respectfully traverse these rejections, as follows.

Applicants disclose a novel and unobvious approach for processing signals that are sent over a wireless communication channel. For example, in accordance with an

embodiment of the disclosure, a receiver may decode a received signal by sampling the received signal with a sampling frequency that is lower than the sampling frequency given by the Shannon theorem, lower than the chip rate of the received signal, but greater than the rate of innovation of the received signal. Such a decoding method may thus reduce the complexity and cost of receivers while retaining equivalent decoding performances. The decoding method of the present invention also reduces the computational requirements of receivers, thus reducing the power consumption in the receiver.

Claim 1 recites, *inter alia*, “sampling the received signal ($y(t)$) with a sampling frequency (f_s) lower than the sampling frequency given by the Shannon theorem, lower than the chip rate ($1/T_c$) of said received signal ($y(t)$), but greater than the rate of innovation (ρ) of said received signal ($y(t)$), for generating a set of sampled values ($y(nT_s)$)” (emphasis added). Claims 28, 34, and 61-62 recite similar features.

In rejecting the claims, the Examiner, at page 8 of the Office Action, acknowledges that the primary reference, Affes, does not disclose or suggest sampling the signal with a sampling frequency that is lower than the chip rate ($1/T_c$) of the signal, but greater than the rate of innovation (ρ) of the signal, as recited in claims 1, 28, 34, and 61-62, yet continues to rely on Unser to make up for the lack of disclosure in Affes.

In particular, the Examiner, at pages 8-9 of the Office Action, alleges that because Affes teaches sampling at the chip rate and Unser teaches sampling at the rate of innovation, “it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the known sampling system of Affes in view of Unser to sample in between the known sampling thresholds since such a modification yields predictable results and benefits.” Applicants respectfully disagree.

A. Combination of Affes and Unser fails to provide a sampling frequency that is lower than the chip rate, but greater than the rate of innovation, as recited in claims 1, 28, 34, and 61-62.

Applicants do not contend that Unser discloses sampling a signal at the rate of innovation. Unser, at section V, B, lines 7-9, states that “a reconstruction is generally possible provided there are as many measurements as there are degrees of freedom in the signal representation.” As the Examiner accurately suggested, the rate of innovation of a signal is defined as the number of degrees of freedom of the signal per unit time. It logically follows then that Unser teaches that reconstruction of a signal is possible provided that the sampling rate is equal to the rate of innovation of the signal.

Applicants also do not contend that Affes discloses sampling a signal at a chip rate. Specifically, Affes, in paragraph [0119], discloses that “the matched filtered signal vector $Y(t)$... is sampled by sampler 23 at the chip rate $1/T_c$ ” (emphasis added).

Therefore, if the skilled person was to combine the teaching of Unser with Affes they would arrive at a method of processing a signal which involves the step of sampling the received signal with a sampling frequency which is equal to the innovation of the signal or, alternatively sampling the received signal with a sampling frequency which is equal to rate of innovation. The resulting method would not involve sampling “with a sampling frequency lower than the chip rate of said received signal, but greater than the rate of innovation of said received signal”, as is required in claims 1, 28, 34, and 61-62.

Accordingly, the skilled person would not arrive at the present invention from the combined teaching of Affes and Unser, so claims 1, 28, 34, and 61-62 must each be considered inventive over Affes in view of Unser.

B. Affes and Unser provide no motivation to sample at a sampling frequency that is lower than the chip rate, but greater than the rate of innovation, as recited in claims 1, 28, 34, and 61-62.

Applicants respectfully submit that it would not have been obvious to one of ordinary skill in the art to modify the method arrived at from the combined teaching of Affes and Unser, so as to sample at a sampling frequency that is lower than the chip rate, but greater than the rate of innovation. Applicants respectfully submit that there exists not motivation in either of Affes and Unser to make such a modification.

Specifically, Affes, in paragraph [0119], discloses that “the matched filtered signal vector $Y(t)$... is sampled by sampler 23 at the chip rate $1/T_c$ ” (emphasis added), and not at a rate lower than the chip rate. In paragraphs [0138]-[0139], Affes states that “after sampling at the chip rate $1/T_c$ and framing over $2L-1$ chip samples at the bit rate to form a frame, the preprocessing unit 18 derives the $M \times (2L - 1)$ matched-filtering observation matrix.” Throughout paragraphs [0140]-[0145], Affes describes how using a post-correlation data model (PCM) with the matrix parameters derived from sampling the signal vector $Y(t)$ at the chip rate $1/T_c$, advantageously, reduces inter-symbol interference.

Unser, on the other hand, emphasizes in section V, B, lines 7-9, that, advantageously, reconstruction of a signal is possible provided that the sampling rate is equal to the rate of innovation of the signal.

Affes and Unser encourage the skilled person to sample at either the chip rate, or at the rate of innovation, by emphasising the advantages associated with particular sampling frequencies. Neither Affes nor Unser teach that there is an advantage to sampling at any other sample frequency other than the chip rate or at the rate of innovation sample

frequency. Accordingly, there is no motivation in Affes or Unser for the skilled person to sample at any other sampling frequencies other than chip rate or at the rate of innovation.

In conclusion, as outlined in paragraph "A" if the skilled person combined the teaching of Unser with Affes they would fail to arrive at the present invention as the resulting method would not involve sampling at the sampling frequency recited in claims 1, 28, 34, and 61-62. Furthermore, given that Affes and Unser detail the advantages of sampling at the chip rate and at the rate of innovation, and do not associate advantages with any other sampling frequency, the skilled person would not be motivated to modify the sampling frequency of the resulting method to sample at any other sample frequency other than chip rate, or at the rate of innovation.

In particular, there is no motivation in either of Unser with Affes which would encourage the skilled person to sample within the specific range of between the chip rate and the rate of innovation. Accordingly, there is nothing in either Unser with Affes which would lead the skilled person to the invention of claims 1, 28, 34, and 61-62, so each or claims 1, 28, 34, and 61-62 must be considered inventive over Affes in view of Unser.

C. Combination of Affes and Unser with Pedersen et al, Haga et al or Pawelski, fails to provide a sampling frequency that is lower than the chip rate, but greater than the rate of innovation, as recited in claims 1, 28, 34, and 61-62.

Pedersen et al, Haga et al or Pawelski disclose the concept of under-sampling and the advantages and disadvantages associated therewith. However, neither Pedersen et al, Haga et al nor Pawelski disclose, or even hint at, sampling within the specific sampling frequency range "lower than the chip rate of said received signal, but greater than the rate of innovation of said received signal". Consequently, even if the skilled person had

considered any of Pedersen et al, Haga et al or Pawelski in combination with Affes and Unser, they could not arrive at the present invention. Accordingly, claims 1, 28, 34, and 61-62 are each inventive over Affes and Unser in view of Pedersen et al, Haga et al and/or Pawelski.

D. Pedersen et al, Haga et al and Pawelski teaches away from sampling at a sampling frequency that is lower than the chip rate, but greater than the rate of innovation, as recited in claims 1, 28, 34, and 61-62.

The innovative step of “sampling the received signal with a sampling frequency lower than the chip rate of said received signal, but greater than the rate of innovation of said received signal”, recited in each of claims 1, 28, 34, and 61-62, reduces the computational requirements of the receiver (see page 5 lines 10-17 of the application as filed). Advantageously, reducing the computational requirements of the receiver will result in a reduction of the power consumption at the receiver.

As previously discussed in paragraph “A”, if the skilled person combined the teaching of Unser with Affes they would arrive at a method of processing a signal which involves the step of sampling the received signal with a sampling frequency which is equal to the innovation of the signal or, alternatively, sampling the received signal with a sampling frequency which is equal to rate of innovation. In the paragraph (1) of the “Response to Arguments”, the Examiner has claimed that Pedersen et al, Haga et al and Pawelski each provide motivation for modifying the sampling frequency of the method resulting from the combined teaching of Affes and Unser, to arrive at the present invention. The applicant respectfully disagrees.

Each of Pedersen et al, Haga et al and Pawelski teach that reducing the sampling frequency reduces power consumption of the processing elements. Accordingly, having considered the teaching of Pedersen et al, Haga et al and Pawelski the skilled person would realise that it is advantageous to sample at a lower frequency. Thus, the skilled person would sample at the frequency disclosed in Unser i.e. at a rate equal to the rate of innovation of the signal, as this sampling frequency is lower than the sampling frequency disclosed in Affes i.e. a sampling rate equal to the chip rate. Thus, having considered the teaching of Pedersen et al, Haga et al and Pawelski in combination with Affes and Unser, the skilled person would be lead away from sampling within the specific sampling frequency range of “greater than the rate of innovation of said received signal”, as recited in each of claims 1, 28, 34, and 61-62. Thus, the skilled person would be lead away from the invention of claims 1, 28, 34, and 61-62.

There is no teaching in any of Pedersen et al, Haga et al and Pawelski which would encourage the skilled person to maintain the sampling frequency at a rate which is “greater than the rate of innovation of the received signal”. On the contrary, to achieve the same advantages of the present invention (i.e.to achieve a reduction of the power consumption at the receiver), the skilled person would be motivated to lower the sampling frequency as much as possible to achieve the maximum reduction in power consumption. Accordingly, in light of the advantages associated with lower sampling frequencies disclosed in Pedersen et al, Haga et al and Pawelski, the skilled person would be encouraged to lower the sampling frequency so that it is less than the rate of innovation of the received signal. Thus, having considered the teaching of Pedersen et al, Haga et al and Pawelski the skilled person would be lead away from sampling within the specific sampling frequency range which is

“greater than the rate of innovation of said received signal” and thus lead away from the invention of claims 1, 28, 34, and 61-62.

E. Modifying Affes with a sampling frequency that is lower than the chip rate, but greater than the rate of innovation, would render the system of Affes inoperable for its intended purpose.

Applicants respectfully submit that one of ordinary skill in the art would not be motivated to lower the sampling frequency of Affes to below the chip rate, as suggested by the Examiner, because such a modification would cause the device of Affes unable to reduce inter-symbol interference as a result of the lower sampling rate, rendering the device of Affes inoperable for its intended purpose.

If a reference is cited that requires some modification in order to meet the claimed invention or requires some modification in order to be properly combined with another reference and such a modification destroys the purpose or function of the invention disclosed in the reference, one of ordinary skill in the art would not have found a reason to make the claimed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

F. Examiner’s rationale for combining Affes and Unser is improper.

In general, it appears that the Examiner’s rationale for combining the teachings of Affes and Unser is to achieve the benefits identified in Applicants’ Specification (e.g., to reduce the complexity and cost of receivers while retaining equivalent decoding performances (paragraph [0011] of the published Specification)). Applicants respectfully

submit that this is an unacceptable and improper basis for a rejection under 35 U.S.C. § 103.

In essence, the Examiner is basing the rejection on the assertion that it would have been obvious to do something not suggested in the art because so doing would provide advantages stated in Applicants' Specification. This sort of rationale has been condemned by the CAFC; see, for example, *Panduit Corp. v. Dennison Manufacturing Co.*, 1 USPQ2d 1593 (Fed. Cir. 1987).

Referring to the Examiner's comments in paragraph (5) of the "Response to Arguments", it is submitted that Pedersen et al, Haga et al and Pawelski provide no motivation which would encourage the skilled person to take steps to provide a method for processing a signal which will allow for a reduction in the complexity and cost of receivers while retaining equivalent decoding performances. Pedersen et al, Haga et al and Pawelski address how one can avoid the introduction of distortion and how one can reduce power consumption; the problem of how to reduce the complexity and cost of receivers is not even recognized in Pedersen et al, Haga et al or Pawelski. Thus it cannot be said that Pedersen et al, Haga et al or Pawelski provide motivation to develop or modify a method for processing a signal, to allow for a reduction in the complexity and cost of receivers while retaining equivalent decoding.

G. Examiner's allegation of obviousness lacks sufficient documentary evidence.

The Examiner has not provided any documentary evidence suggesting that one of ordinary skill would have been motivated to modify Affes, or the method resulting from the combined teaching of Affes and Unser, as suggested by the Examiner. As

discussed in paragraph “D” above, each of Pedersen et al, Haga et al and Pawelski teach away from a sampling frequency that is lower than the chip rate, but greater than the rate of innovation, as recited in claims 1, 28, 34, and 61-62. Thus, it cannot be said that Pedersen et al, Haga et al and Pawelski provide motivation to modify Affes, or the method resulting from the combined teaching of Affes and Unser, to arrive at the invention of claims 1, 28, 34, and 61-62, as suggested by the Examiner.

Otherwise, the Examiner’s rationale for modifying Affes, or the method resulting from the combined teaching of Affes and Unser, appears to be derived from the knowledge gleaned solely from the Applicants’ disclosure. Applicants request that the Examiner cite a reference in support of the position pursuant to MPEP 2144.03 if the rejection of the independent claims is maintained. Absent documentary support, Applicants respectfully submit that the features recited in the claims are not obvious over Affes, Unser, Pedersen et al, Haga et al and Pawelski, and the claims are believed to be allowable for at least the above stated reasons.

H. Examiner has failed to establish a proper *prima facie* case of obviousness.

To reject claims in an application under § 103, the Examiner must establish a *prima facie* case of obviousness. A *prima facie* case of obviousness is established by a showing of three basic criteria. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. See MPEP §2143. The teaching

or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. See *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Here, the Examiner has failed to meet all of the three criteria required for a *prima facie* case of obviousness. Specifically, the Examiner (1) failed to present any documentary evidence of motivation either in the Affes or Unser, Pedersen et al, Haga et al and Pawelski, or in the knowledge generally available to one of ordinary skill in the art, to modify Affes or to combine reference teachings; (2) the Examiner failed to show how the proposed modification of Affes has a reasonable expectation of success, as the proposed modification would render Affes inoperable for its intended purpose; and (3) the Examiner failed to show that Affes, Unser, Pedersen et al, Haga et al and Pawelski, teach or suggest all the claim limitations (e.g., sampling the received signal with a sampling frequency lower than the chip rate of said received signal, but greater than the rate of innovation of said received signal, as recited in claims 1, 28, 34, and 61-62) and has failed to show how any of these documents could be combined to arrive at the invention of claims 1, 28, 34, and 61-62. As such, the Examiner has failed to establish a proper *prima facie* case of obviousness.

* * * * *

Secondary references Agee, Huang, Shatti, Langberg, Baum, either individually or in combination with Affes and Unser also fail to disclose or suggest the features recited in claims 1 and 28, 34, and 61-62, and as such, fail to make up for the deficiencies of Affes and Unser.

In view of the foregoing, Applicants submit that claims 1, 28, 34, and 61-62 define patentable subject matter. Claims 2-33 and 35-60 depend from claims 1 and 34,

August 23, 2010

respectively, and therefore, also define patentable subject matter, as well as for the additional features recited therein. Accordingly, Applicants respectfully request that the rejections be withdrawn.

II. Conclusion

In light of the amendments contained herein, Applicants submit that the application is in condition for allowance, for which early action is requested.

Should the Examiner is still of the opinion that the application is not in order for grant, then we would request an interview with the Examiner. In the event an interview is necessary, the Examiner is requested to contact the undersigned at the telephone number set forth below.

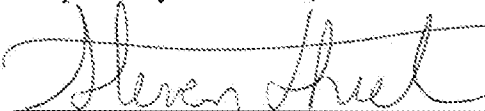
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